

**LAWRENCE LIVERMORE NATIONAL LABORATORY**  
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**LLNL**  
**FOREIGN TRIP REPORT**  
**LLNL-AR-787337**

**DATE:** Aug 9, 2019

**SUBJECT:** Report of Foreign Travel to Lisbon, Portugal

**TO:** Dr. Angela Chambers, USDOE Nuclear Criticality Safety Program Manager, National Nuclear Security Administration, NA-511

**FROM:** Anthony J. Nelson, Nuclear Criticality Safety Engineer, Lawrence Livermore National Laboratory

**MEETING TITLES:**

- 3<sup>rd</sup> International Conference on Dosimetry and its Applications

**MEETING LOCATION:**

Congress Centre of IST (Civil Engineering Pavillion)  
Instituto Superior Técnico – University of Lisbon  
Avenida Rovisco Pais, 1  
1049-001 Lisboa – Portugal

**MEETING DATES:**

May 27-31, 2019

**ATTENDEES ON BEHALF OF NCSP:**

Anthony Nelson, Daniel Stone

**MEETING BENEFITS TO NCSP:**

The 3<sup>rd</sup> International Conference on Dosimetry and its Applications is a major gathering of experts in radiation detection, dosimetry, shielding, simulation, and regulation from around the world. There were many dedicated tracks relevant to criticality safety with a specific emphasis radiation protection and characterization including:

- Neutron Dosimetry
- Nuclear Data and Evaluation
- Dosimetry in radiological and nuclear emergencies and accidents
- Individual Dosimetry and Monitoring
- Monte Carlo and hybrid methods in Dosimetry and Radiation Measurement
- Computational Dosimetry and Phantoms
- Internal Dosimetry and Biokinetic models
- Biodosimetry, Radiobiology and Retrospective Dosimetry
- Environmental Dosimetry, radioactivity measurement and monitoring
- Micro- and Nanodosimetry
- Radiation Protection and Dosimetry in Industry
- Dosimetry of radon exposures
- Low dose and protracted exposures
- Radiation Shielding and Dosimetry at Accelerators
- Dosimetry in Space applications

Based on the results from the most recent nuclear accident dosimetry intercomparison<sup>1</sup> it is clear that dosimetry is an area where development of expertise is greatly needed. Attendance at the conference is of major benefit in this regard, allowing Daniel and Tony to learn about best practices and new developments in the field of dosimetry across a wide range of countries and applications.

#### **MEETING PURPOSE:**

The purpose of this meeting was to bring together dosimetry experts from around the world to share developing technology, computational tools, best practices, regulatory views, and advancing technology in a wide range of dosimetry applications. These applications include nuclear accident dosimetry, individual dose monitoring of radiation workers, radiation shielding and many others. The conference program is listed below:

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<sup>1</sup> Daniel Stone. *Intercomparison of Nuclear Accident Dosimetry using the Flattop Reactor at NCERC, IER-253 CED-4 Report*. LLNL-PRES-769622. NCSP Technical Program Review. Amarillo, TX. March 26-27, 2019

CONFERENCE PROGRAM:

# Conference Programme

## Monday May, 27

Time	Poster Session 1 (all day)		
8:30 – 9:15	<b>REGISTRATION</b> (8:00 – 9:00)	Neutron dosimetry and measurement techniques (M. Silari)	Development of dosimetric quantities and units, as reflected in the ICRU recommendations (L. Musilek)
9:20 – 11:00	<b>Opening &amp; Plenary Session I1 – Computational Dosimetry</b> <i>Session chairs: Pedro Vaz, Isabel Lopes</i>		
	<b>OPENING</b> (25min)		
	I1.1 – Jenia Vassileva: IAEA Views (25 min)		
	I1.2 – Werner Rühm: EURADOS Views (25 min)		
	I1.3 – Shaheen Dewji: Grand Challenges in the American Nuclear Society: Resolutions by 2030 (25 min)		
11:00 – 11:20	Coffee-Break		
11:20 – 13:00	<b>Plenary session I1 (cont.) – Computational Dosimetry</b> <i>Session chairs: Pedro Vaz, Isabel Lopes</i>		
	I1.4 – David Bradley: IRPS: approaching 40 years of existence (25 min)		
	I1.5 – Nolan Hertel: Radiation Protection Dosimetry Research: A View From the USA (25 min)		
	I1.6 – George Xu: The impact of phantoms, realtime Monte Carlo simulation, and machine-learning on radiation dosimetry (25 min)		
	I1.7 – C.H. Kim: ICRP mesh-type reference computational phantoms and high-fidelity deformation for body-size and posture change (25 min)		
13:00 – 14:15	Lunch-Break		
14:15 – 15:55	<b>Radiation Protection in Medicine I (Radiotherapy)</b> <i>Session chairs: Antje Knopf, Joana Santos</i>	<b>Micro and Nanodosimetry I</b> <i>Session chairs: Carmen Villagrasa, Alessio Parisi</i>	<b>Internal Dosimetry and Biokinetic models I</b> <i>Session chairs: M.A. López, Pedro Teles</i>
	O1.1 – Gonzalo Garcia (20 min)	O1.1 – Carmen Villagrasa (15 min)	O1.1 – Sergei Tolmachev (15 min)
	O1.2 – Gabriele Magugliani (20 min)	O1.2 – Alessio Parisi (15 min)	O1.2 – M.A. López (15 min)
	O1.3 – Grazia Gambarini (20 min)	O1.3 – Juan Prieto-Pena (15 min)	O1.3 – Anna Pántya (15 min)
	O1.4 – Andreia Oliveira (20 min)	O1.4 – Davide Mazzucconi (15 min)	O1.4 – Gumersindo Verdú (15 min)
		O1.5 – Davide Bortot (15 min)	O1.5 – Pedro Teles (15 min)
		O1.6 – Anna Bianchi (15 min)	O1.6 – Hsin-Hon Lin (15 min)
15:55– 16:15	Coffee-Break		
16:15 – 17:55	<b>Radiation Protection in Medicine II (Radiotherapy)</b> <i>Session chairs: Manuel Bardiès, M.C. Lopes</i>	<b>Neutron Dosimetry I</b> <i>Session chairs: Stefano Agosteo, Carles Domingo</i>	<b>Individual Dosimetry and Monitoring I</b> <i>Session chairs: Ladislav Musilek, Lawrence Hudson</i>
	O2.1 – Francisco Henriquez (20 min)	O1.1 – Carles Domingo (20 min)	O1.1 – Larry Hudson (20 min)
	O2.2 – Natália Alves (20 min)	O1.2 – A. Devienne (20 min)	O1.2 – Miroslav Voytchev (20 min)
	O2.3 – Ana Cravo Sá (20 min)	O1.3 – Carles Domingo (20 min)	O1.3 – Inmaculada Sierra (20 min)
	O2.4 – Francisco Henriquez (20 min)	O1.4 – Grazia Gambarini (20 min)	O1.4 – Fabio Pozzi (20 min)

# Conference Programme

## Tuesday May, 28

Time	Poster Session 2 (all day)		
8:30 – 9:15	Extremity dosimetry (F. Vanhavere)	Internal Dosimetry (P. Teles)	
9:20 – 11:00	Plenary Session I2 – Radiation Protection and Dosimetry In Medicine Session chairs: Jenia Vassileva, Eliseo Vaño		
	I2.1 – Jenia Vassileva: Patient exposure monitoring in medical imaging: why and how? (25 min)		
	I2.2 – Eliseo Vaño: Automatic patient dose registry and help in the optimisation and audit of interventional procedures (25 min)		
	I2.3 – Manuel Bardiès: Patient-specific dosimetry in Molecular radiotherapy (25 min)		
11:00 – 11:20	Coffee-Break		
11:20 – 13:00	<b>Radiation Protection in Medicine III (Radiotherapy)</b> Session chairs: Jenia Vassileva, Ana Cravo Sá	<b>Environmental Dosimetry, radioactivity measurement and monitoring I</b> Session chairs: J. Francisco Navarro, José Rodénas	<b>Monte Carlo and hybrid methods in Dosimetry I</b> Session chairs: Christopher Chantler, Luís Peralta
	O3.1 – Emily Russell (15 min)	O1.1 – Aina Noverques (20 min)	O1.1 – Catherine da Silva (20 min)
	O3.2 – Lorenzo Isolan (15 min)	O1.2 – Maksym Luchkov (20 min)	O1.2 – Manon Jacquemin (20 min)
	O3.3 – Keida Kanxheri (15 min)	O1.3 – Natalie Heracleous (20 min)	O1.3 – Richard Hugtenburg (20 min)
	O3.4 – Ouiza Moussous (15 min)	O1.4 – José Corisco (20 min)	O1.4 – André Gomes Otero (20 min)
	O3.5 – E. Tomarchio (15 min)		
	O3.6 – Alessio Parisi (15 min)		
13:00 – 14:15	Lunch-Break		
14:15 – 15:55	<b>Radiation Shielding and Dosimetry at Accelerators I</b> Session chairs: Marco Silari, Yuriy Romanets	<b>Computational Dosimetry and Phantoms I</b> Session chairs: George Xu, Shaheen Dewji	<b>Biodosimetry, Radiobiology and Retrospective Dosimetry</b> Session chairs: João Seco, Octávia Monteiro Gil
	O1.1 – A. Devienne (20 min)	O1.1 – Daiki Satoh (20 min)	O1.1 – João Seco (15 min)
	O1.2 – Radu Alin Vasilache (20 min)	O1.2 – Jonathan Dean (20 min)	O1.2 – Géraldine Gonon (15 min)
	O1.3 – Victoria Corregidor (20 min)	O1.3 – Takuya Furuta (20 min)	O1.3 – N.T. Tavares (15 min)
		O1.4 – Elisabeth Hansen (20 min)	O1.4 – P. Costa (15 min)
		O1.5 – Joana Vale (20 min)	O1.5 – Jose Chimeno (15 min)
			O1.6 – Ana Belchior (15 min)
15:55– 16:15	Coffee-Break		
16:15 – 17:55	<b>Radiation Protection in Medicine IV (Imaging)</b> Session chairs: Eliseo Vaño, Eric Shirley	<b>Dosimetry in radiological and nuclear emergencies and accidents I</b> Session chairs: Luís Neves, Daiki Satoh	<b>Individual Dosimetry and Monitoring II</b> Session chairs: Filip Vanhavere, Isabel Lopes
	O4.1 – Luís Peralta (20 min)	O1.1 – Shaheen Dewji (20 min)	O2.1 – Ladislav Musilek (20 min)
	O4.2 – Francisco Henriquez (20 min)	O1.2 – José Ródenas (20 min)	O2.2 – Filip Vanhavere (20 min)
	O4.3 – Fernanda Santos (20 min)	O1.3 – J. Francisco Navarro (20 min)	O2.3 – Sabina Yasmin (20 min)
	O4.4 – Pedro Teles (20min)	O1.4 – Olivier Van Hoey (20 min)	

Wednesday May, 29

Time	Poster Session 3 (all day)		
8:30 – 9:15	Animating computational human phantoms using 3-D motion-capture data and their applications in personal dosimetry (M. Abdelrahman)	Use of computational human phantoms in medical applications (G.Xu)	
9:20 – 11:00	Plenary Session I3 – Hot Dosimetry topics I Session chairs: Hans Rabus, Filip Vanhavere		
	I3.1 – Hans Rabus: Nanodosimetry – past, present, future (25 min)		
	I3.2 – João Seco: Think Like a Proton .... Stay Positive: Cutting Edge Ideas in Proton Therapy (25 min)		
	I3.3 – Filip Vanhavere: Radiation-induced lens opacities among interventional cardiologists (25 min)		
	I3.4 – Christopher Chantler: Quantification of X-ray methodologies and extraction of reliable and new insight (25 min)		
11:00 – 11:20	Coffee-Break		
11:20 – 13:00	<b>Radiation Protection in Medicine V (Imaging)</b> Session chairs: David Bradley, Maria Carmen Sousa	<b>Environmental Dosimetry, radioactivity measurement and monitoring II</b> Session chairs: Pasquale Fulvio, Maria José Madruga	<b>Monte Carlo and hybrid methods in Dosimetry II</b> Session chairs: Richard Hugtenburg, Ana Belchior
	O5.1 – Teodoro Rivera-Montalvo (15 min)	O2.1 – Vladimir Mares (20 min)	O2.1 – Ladislav Musilek (15 min)
	O5.3 – Hugo Schelin (15 min)	O2.2 – C.A. Federico (20 min)	O2.2 – José Ródenas (15 min)
	O5.4 – Chien Yi Ting (15 min)	O2.3 – Sadia Assad (20 min)	O2.3 – Débora António (15 min)
	O5.5 – Hugh Wilkins (15 min)	O2.4 – Maria José Madruga (20 min)	O2.4 – Georgina Benítez (15 min)
	O5.6 – Agnieszka Szumska (15 min)	O2.5 – Aina Noverques (20 min)	O2.5 – Maria Pinilla (15 min)
			O2.6 – Jorge M Sampaio (15 min)
13:00 – 14:15	Lunch-Break		
14:15 – 18:00	SOCIAL PROGRAMME		
18:00 – 20:00			
20:00 – 23:00	CONFERENCE DINNER		

# Conference Programme

## Thursday May, 30

Time	Poster Session 4 (all day)		
8:30 – 9:15	Establishment and use of DRLs (J. Vassileva)	Dosimetry audits in Radiotherapy (M.C. Lopes)	
9:20 – 11:00	<b>Plenary Session I4 – Low dose radiation effects and Radiobiology</b> <i>Session chairs: Werner Rühm, Liz Ainsbury</i>		
	I4.1 – Werner Rühm: Recent Work of ICRP Committee 1 on Radiation Effects – From Low-Dose and Low-Dose-Rate Effects to Individual Radiation Response (25 min)		
	I4.2 – Liz Ainsbury: Interdisciplinary dosimetry research supporting medical (and wider) uses of ionising radiation (25 min)		
	I4.3 – Susana Constantino: Low doses of ionizing radiation: where do we stand now? (25 min)		
11:00 – 11:20	I4.4 – Shaheen Dewji: A Roadmap to a Roadmap: Perspectives on Recent Low Dose Initiatives in the United States (25 min)		
	Coffee-Break		
11:20 – 13:00	<b>Dosimetry of radon exposures</b> <i>Session chairs: Alain Rannou, Mário Reis</i>	<b>Computational Dosimetry and Phantoms II</b> <i>Session chairs: C.H. Kim, Mahmoud Abdelrahman</i>	<b>Monte Carlo and hybrid methods in Dosimetry III</b> <i>Session chairs: David Broggio, Jorge Fernandez</i>
	O1.1 – Maria Lurdes Dinis (15 min)	O2.1 – J.F. Benavente (20 min)	O3.1 – Ricardo Augusto (20 min)
	O1.2 – Alcides Pereira (15 min)	O2.2 – Hans Rabus (20 min)	O3.2 – M.N. Kinakin (20 min)
	O1.3 – Yoenls Prata (15 min)	O2.3 – Salvatore di Maria (20 min)	O3.3 – Rong-Jiun Sheu (20 min)
	O1.4 – Mário Reis (15 min)	O2.4 – Weishan Chang (20 min)	O3.4 – Tiago Ribeiro (20 min)
	O1.5 – Yoenls Prata (15 min)	O2.5 – Ana Denis-Bacelar (20 min)	O3.5 – David Redondo (20 min)
	O1.6 – Lufs Peralta (15 min)		
13:00 – 14:15	Lunch-Break		
14:15 – 15:55	<b>Radiation Shielding and Dosimetry at Accelerators II</b> <i>Session chairs: Werner Rühm, Diego Di Francesca</i>	<b>Micro and Nanodosimetry II</b> <i>Session chairs: Hans Rabus, Alejandro Carabe-Fernandes</i>	
	O2.1 – Richard Hugtenburg (20 min)	O2.1 – Valeria Conte (15 min)	
	O2.2 – Diego Di Francesca (20 min)	O2.2 – Florian Heimbach (15 min)	
	O2.3 – Gabriele Zorloni (20 min)	O2.3 – Anna Selva (15 min)	
	O2.4 – Masafumi Akiyoshi (20 min)	O2.4 – Hans Rabus (15 min)	
		O2.5 – Volker Dangendorf (15 min)	
15:55 – 16:15		O2.6 – Aleksandr Bancer (15 min)	
	Coffee-Break		
16:15 – 17:55	<b>Radiation Protection in Medicine VI (Staff dosimetry)</b> <i>Session chairs: M. Francesca Spadea, Marta F. Dias</i>	<b>Radiation Protection and Dosimetry in Industry &amp; NORM</b> <i>Session chairs: Frank Becker, Maria de Lurdes Dinis</i>	<b>Neutron Dosimetry II</b> <i>Session chairs: Nolan Hertel, Michał Kuć</i>
	O6.1 – Katharina Bairlein (20 min)	O1.1 – Jovica Atanackovic (20 min)	O2.1 – E. Tomarchio (20 min)
	O6.2 – Hayo Zutz (20 min)	O1.2 – Christopher Chantler (20 min)	O2.2 – Michał Kuć (20 min)
	O6.3 – Oliver Hupe (20 min)	O1.3 – Frank Becker (20 min)	O2.3 – R. Méndez-Villafañe (20 min)
	O6.4 – Cristian Candela-Juan (20min)	O1.4 – Thomas Quirk (20 min)	
	O6.5 – Cristian Candela-Juan (20min)	O1.5 – Marina Sáez-Muñoz (20 min)	

# Conference Programme

## Friday May, 31

Time	Poster Session 5 (all day)		
8:30 – 9:15	The New ICRU Recommendations for Neutron Dose Coefficients and the impacts of neutron resonances (N. Hertel)		
9:20 – 11:00	<b>Plenary Session I5 – Hot Dosimetry topics II</b> <i>Session chairs: Eduardo Gallego, Alain Rannou</i>		
	I5.1 – Eduardo Gallego: Dosimetry issues in Radiological and Nuclear Emergency Preparedness and Response (25 min)		
	I5.2 – Alain Rannou: RADON DOSIMETRY- Biological, internal dosimetry and radiometric issues (25 min)		
	I5.3 – Marco Silari: Dosimetry at Accelerators - State-of-the-art and challenging issues (25 min)		
	I5.4 – José Ródenas: Application of dosimetry to estimate activity in irradiated samples (25 min)		
11:00 – 11:20	Coffee-Break and Poster Session 5		
11:20 – 13:00	<b>Dosimetry in space applications</b> <i>Session chairs: Vladimir Mares, Amir Bahadori</i>	<b>Radiation Protection in Medicine VII</b> <i>Session chairs: Linda Caldas, Salvatore di Maria</i>	<b>Dosimetry in radiological and nuclear emergencies and accidents II</b> <i>Session chairs: Eduardo Gallego, Isabel paiva</i>
	O1.1 – Amir Bahadori (20 min)	O7.1 – Abdelmoneim Sulieman (20 min)	O2.1 – Joyce Silvestre (20 min)
	O1.2 – Ana Luisa Casimiro (20 min)	O7.2 – Wiam Elshami (20 min)	O2.2 – Marina Sáez Muñoz (20 min)
	O1.3 – Marco Pinto (20 min)	O7.3 – Leonello Servoli (20 min)	O2.3 – J.F. Navarro (20 min)
	O1.4 – Rong-Jiun Sheu (20 min)	O7.4 – Salvatore di Maria (20 min)	O2.4 – Ämilie Erbe (20 min)
13:00 – 14:15	<b>WRAP-UP &amp; CLOSING</b>		